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in a section of 27 students. Show that, had the whole class of one thousand taken the work in one large section, the most probable result is that B would have finished the semester's work six places ahead of A , and that the expectation of B 's lead on A is 11.

2789. Proposed by KURT LAVES, University of Chicago.

Given a quadrilateral $ABCD$ for which $AC + BC < AD + BD$ to construct, by means of the ruler and compass only, the pair of tangents from D to the hyperbola (ellipse) for which A and B are the foci and C a point on the hyperbola (ellipse).

2790. Proposed by J. W. LASLEY, JR., University of North Carolina.

How shall we buy 12 eggs for 80 cents, if eggs sell as follows: hen eggs at 5 cents each, duck eggs at 7 cents each, and turkey eggs at 8 cents each, provided we buy some of each?

2791. A cup of wine is suspended over a cup of equal capacity full of water; through a small hole in the bottom, the wine drips into the water, and the mixture drips out at the same rate. When the wine cup is empty, what part of the contents of the lower cup is water? [Proposed by Charles Gilpin, Jr., Philadelphia, as Problem 287 in *The Mathematical Visitor*, January, 1881, volume 1, page 193. No solution was published in the *Visitor*.]

2792. Proposed by B. J. BROWN, Kansas City.

Solve the differential equation,

$$x^2(1-x)\frac{d^2y}{dx^2} + 2x(2-x)\frac{dy}{dx} + 2(1+x)y = x^2.$$

461 (Algebra) [June, 1916]. Proposed by E. T. BELL, University of Washington.

(1) Two events have probabilities p, q respectively. The events may be either (i) mutually independent; or (ii) mutually exclusive. Assign meanings to the symbol p^q , in terms of the two events where p^q is written for $p \times p \times \cdots \times p$, (q factors p), in cases (i), (ii), and $p \times p$ has the customary meaning (as a probability).

(2) What relations, if any, other than (i) and (ii) can exist between two events? Upon what postulates is the answer to this based?

463A (Geometry) [May. 1915]. Proposed by B. J. BROWN, Kansas City.

If μ and ν are the parameters of the two confocal conics through any point on the ellipsoid

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1,$$

show that $\mu + \nu + a^2 + c^2 = 0$, along a central circular section.

470 (Geometry) [September, 1915]. Proposed by R. E. MORITZ, University of Washington.

Prove that

$$\theta = (\lambda + (q/p)\mu)\pi, \quad (\lambda = 1, 2, 3, \dots, q-1; \mu = 0, 1, 2, \dots, p-1),$$

and

$$\theta = (2\lambda - 1)\pi/2 + (q/p)(4\mu \pm 1)\pi/2, \quad (\lambda = 1, 2, 3, \dots, (q-1)/2; \mu = 0, 1, 2, \dots, p-1),$$

determine the same set of points on the curve $\rho = a \cos(q/p)\theta$, where p and q are two odd integers without a common factor, and a is any constant.

499 (Geometry) [November, 1916]. Proposed by NATHAN ALTHILLER, University of Oklahoma.

Find the surfaces all the plane sections of which are circles.

501 (Geometry) [November, 1916]. Proposed by R. P. BAKER, University of Iowa.

Find the minimum amount of lumber one inch thick required to pack a gross of spheres three inches in diameter in a rectangular box.